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09/584,796	06/01/2000	Fredrik Lindqvist	1410-679	4990

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Nixon & Vanderhye PC
8th Floor
1100 North Glebe Road
Arlington, VA 22201-4714

EXAMINER	
JAMAL, ALEXANDER	
ART UNIT	**PAPER NUMBER**
2643	8

DATE MAILED: 11/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/584,796	LINDQVIST ET AL.	
	Examiner	Art Unit	
	Alexander Jamal	2643	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 June 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4-7* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: On page 3 line 28, 'Figure 3' should be 'Figure 2'

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. **Claim1** rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains (a single means claim), or with which it is most nearly connected, to make and/or use the invention. An echo canceller for use in a transceiver covers every conceivable structure for achieving the property of echo cancellation while the specification discloses at most only those means known to the inventor. See In re Hyatt, 708 F.2d712, 714-715,218 USPQ 195,197 (Fed. Cir. 1983).

3. **Claims 11, 33,42** rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The claims refer the Hermitian symmetry of vectors. The Hermitian symmetric concept is applicable to matrices not vectors.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. **Claim 1** rejected under 35 U.S.C. 102(b) as being anticipated by Fertner. (5793801).

a. **Claim 1:** Fertner discloses an echo canceller used in a transceiver that is configured to completely cancel a received echo signal in the frequency domain (ABSTRACT).

b. **Claim 2:** Fertner's echo canceller comprises two matrices (Col 8 lines 30-38) of coefficients. One matrix is comprised of coefficients to be multiplied with a transmitted signal (a.sub.v) and another is comprised of coefficients to be multiplied with a previously transmitted signal (a.sub.v-1) (Col 10 lines 29-35). The values of the two matrices are combined to give the predicted spectral coefficients (Col 14 lines 36-46).

c. **Claim 3:** Fertner discloses that the transmitted signals are real, and as such they are split into the real and imaginary portions, which reduces the computational complexity (Col 8 lines 49-57).

d. **Claim 4:** In Fertner's echo canceller, the coefficients of the first matrix represent how an echo from a currently transmitted frequency domain signal affects a received signal (Col 14 lines 36-46).

e. **Claim 5:** In Fertner's echo canceller, the coefficients of the second matrix represent how an echo from a previously transmitted frequency domain signal affects a received signal (Col 14 lines 36-46).

f. **Claim 6:** In Fertner's echo canceller, the coefficients of the matrices are adapted using a difference (error signal) between the received signal and the estimated echo signal (Col 8 lines 6-17).

g. **Claim 7:** In Fertner's echo canceller, the coefficients are adapted using an LMS algorithm (Col 8 lines 18-22).

h. **Claim 8:** In Fertner's echo canceller, the estimated echo is removed form the received signal as shown at summer 52 in Fig. 3.

i. **Claim 9:** Fertner's echo canceller can be used in any communications system where a signal is sampled then reconstructed (Col 15 lines 41-48), such as in a DMT transceiver.

j. **Claim 10:** In Fertner's echo canceller, the matrices are NxN matrices, with N being the number of symbol samples (Col 8 lines 30-38).

k. **Claim 12:** Fertner's echo canceller comprises a vector (Cn) and a matrix (Col 8 lines 30-38) of coefficients. The vector Cn is comprised of coefficients to be multiplied with a transmitted signal Xn and the matrix (a.sub.v-1) is comprised of coefficients to be multiplied with a previously transmitted signal that is compensated (weighted). The values of the two matrices are combined to give the predicted spectral coefficients (Col 14 lines 36-46).

l. **Claim 13:** Fertner discloses that the transmitted signals are real, and as such they are split into the real and imaginary portions, which reduces the computational complexity (Col 8 lines 49-57).

m. **Claim 14:** In Fertner's echo canceller, the compensation term used to compensate the transmitted and previously transmitted signal is a complex exponential term (Col 10 lines 59-63).

n. **Claim 15:** Fertner's echo canceller can be used in any communications system where a signal is sampled then reconstructed (Col 15 lines 41-48), such as in a DMT transceiver. The compensation term can accurately compensate for sampling phase adjustments, such a cyclic prefix added to the data symbol.

o. **Claim 18:** Fertner discloses an echo canceller comprised of two matrices (Col 8 lines 30-38) of coefficients. One matrix is comprised of coefficients to be multiplied with a transmitted signal (a.sub.v) and another is comprised of coefficients to be multiplied with a previously transmitted signal (a.sub.v-1). The values of the two matrices are combined to give the predicted spectral coefficients (Col 14 lines 36-46). The

coefficients are used to create an estimate of an echo signal in the time domain and that signal is removed from the received signal in the time domain (Col 7 lines 32-39).

p. **Claim 19:** Fertner's echo canceller comprises a vector (Cn) and a matrix (Col 8 lines 30-38) of coefficients. The vector Cn is comprised of coefficients to be multiplied with a transmitted signal Xn and the matrix (a.sub.v-1) is comprised of coefficients to be multiplied with a previously transmitted signal that is compensated (weighted). The products from the two transmitted signals and the vector and matrix are combined to give the predicted spectral coefficients (Col 14 lines 36-46). The coefficients are used to create an estimate of an echo signal in the time domain and that signal is removed from the received signal in the time domain (Col 7 lines 32-39).

q. **Claim 20:** Fertner discloses an echo canceller used in a transceiver that is configured to cancel a received echo signal using a frequency domain estimate of an echo path channel (including the effects of interference) to subtract from the received signal (ABSTRACT) (Col 7 lines 32-39). The circuitry to determine the echo estimate is inherent to the transceiver for the purpose of determining the echo estimate.

r. **Claim 21:** Fertner's echo canceller can be used in any communications system where a signal is sampled then reconstructed (Col 15 lines 41-48), such as in a DMT transceiver. The interference dealt with by Fertner's system includes intersymbol and intercarrier interference (Col 1 lines 24-40).

s. **Claim 22:** In Fertner's echo canceller, the coefficients of the first matrix (a first set of values) represent how an echo from a currently transmitted frequency domain signal affects a received signal (Col 14 lines 36-46). The coefficients of the second

matrix (a second set of values) represent how an echo from a previously transmitted frequency domain signal affects a received signal.

t. **Claim 23:** In Fertner's echo canceller, both sets of numbers are complex (Col 8 lines 49-57) matrices. One matrix is comprised of coefficients to be multiplied with a transmitted signal (a.sub.v) and another is comprised of coefficients to be multiplied with a previously transmitted signal (a.sub.v-1). (Col 14 lines 36-46).

u. **Claim 24:** Fertner's echo canceller comprises a vector (Cn) and a matrix (Col 8 lines 30-38) of coefficients. The vector Cn is comprised of coefficients to be multiplied with a transmitted signal Xn and the matrix (a.sub.v-1) is comprised of coefficients to be multiplied with a previously transmitted signal that is compensated (weighted).

v. **Claim 25:** In Fertner's echo canceller, the second matrix (a.sub.v-1) is combined with the difference between the currently transmitted signal and the previously transmitted signal multiplied with a compensating factor (c) (Col 14 lines 36-46).

w. **Claim 26:** Fertner discloses that the transmitted signals are real, and as such they are split into the real and imaginary portions before being combined with the matrices, which reduces the computational complexity (Col 8 lines 49-57).

x. **Claim 30:** Fertner discloses an echo canceller that may be used in a transceiver (such as a DMT transceiver) that is configured to cancel a received echo signal using a frequency domain estimate of an echo path channel (including the effects of ISI and ICI (Col 1 lines 24-40)) to subtract (provide a difference) from the received signal (ABSTRACT) (Col 7 lines 32-39). The circuitry to determine the echo estimate is inherent to the transceiver for the purpose of determining the echo estimate.

y. **Claim 31:** In Fertner's echo canceller, the coefficients of the first matrix (a first set of values) represent how an echo from a currently transmitted frequency domain signal affects a received signal (Col 14 lines 36-46). The coefficients of the second matrix (a second set of values) represent how an echo from a previously transmitted frequency domain signal affects a received signal.

z. **Claim 32:** Fertner discloses that the transmitted signals are real, and as such they are split into the real and imaginary portions before being combined with the matrices, which reduces the computational complexity (Col 8 lines 49-57).

aa. **Claim 34:** In Fertner's echo canceller, the coefficients of the matrices are adapted using a difference (error signal) between the received signal and the estimated echo signal (Col 8 lines 6-17).

bb. **Claim 35:** Fertner discloses a method to reduce echo comprising:

Combining (in the frequency domain) two matrices (Col 8 lines 30-38) of coefficients. One matrix is comprised of coefficients to be multiplied with a transmitted signal (a.sub.v) and another is comprised of coefficients to be multiplied with a previously transmitted signal (a.sub.v-1) in order to produce an echo estimate (Col 14 lines 36-46). The values of the two matrices are combined to give the predicted spectral coefficients. The estimated echo (Col 10 lines 29-35) is subtracted from a received signal in order to reduce the echo.

cc. **Claim 36:** In Fertner's method, the coefficients of the matrices are adapted using a difference (error signal) between the received signal and the estimated echo signal (Col 8 lines 6-17).

dd. **Claim 37:** In Fertner's method, both sets of numbers are complex (Col 8 lines 49-57) matrices. One matrix is comprised of coefficients to be multiplied with a transmitted signal (a.sub.v) and another is comprised of coefficients to be multiplied with a previously transmitted signal (a.sub.v-1). (Col 14 lines 36-46).

ee. **Claim 38:** Fertner's method comprises using a vector (Cn) and a matrix (Col 8 lines 30-38) of coefficients. The vector Cn is comprised of coefficients to be multiplied with a transmitted signal Xn and the matrix (a.sub.v-1) is comprised of coefficients to be multiplied with a previously transmitted signal that is compensated (weighted).

ff. **Claim 39:** In Fertner's method, the coefficients of the matrices are adapted using a difference (error signal) between the received signal and the estimated echo signal (Col 8 lines 6-17).

gg. **Claim 43:** Fertner discloses that the transmitted signals are real, and as such they are split into the real and imaginary portions, which reduces the computational complexity (Col 8 lines 49-57).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claim 16,17** rejected under 35 U.S.C. 103(a) as being unpatentable over Fertner (5793801) as applied to claim 1 above, and further in view of Chow et al. (5787113).

a. **Claims 16,17:** Fertner discloses applicant's claim 1, but he fails to mention interpolating the echo signal in the case where the transmitter has a lower sampling rate than the receiver.

Chow teaches that in asymmetric DMT systems (such as ADSL) the upstream data travels at a different rate than the downstream data. He further teaches the use of interpolation of the echo signal in a system with a faster receiver (Fig. 7), and decimation in a system with a faster transmitter (Fig. 8) (Col 12 lines 9-22). It would have been obvious to one of ordinary skill in the art at the time of this application to either decimate or interpolate the echo signal as needed for the purpose of accounting for the different sampling rates between the transmitter and receiver.

8. **Claim 27,28,29** rejected under 35 U.S.C. 103(a) as being unpatentable over Fertner (5793801) as applied to claim 20 above, and further in view of Chow et al. (5787113).

a. **Claims 27,28:** Fertner discloses applicant's claim 20, but he fails to mention interpolating the echo signal in the case where the transmitter has a lower sampling rate than the receiver.

Chow teaches that in asymmetric DMT systems (such as ADSL) the upstream data travels at a different rate than the downstream data. He further teaches the use of interpolation of the echo signal in a system with a faster receiver (Fig. 7), and decimation in a system with a faster transmitter (Fig. 8) (Col 12 lines 9-22). It would have been obvious to one of ordinary skill in the art at the time of this application to either decimate

or interpolate the echo signal as needed for the purpose of accounting for the different sampling rates between the transmitter and receiver.

b. Claim 29: Chow discloses an ADSL transceiver in which the transmitted and received symbols are not aligned in time (CHOW: Col 12 lines 9-22). Fertner's coefficients are used to create an estimate of an echo signal in the time domain and that signal is removed from the received signal in the time domain (FERTNER: Col 7 lines 32-39).

9. Claim 40,41,44 rejected under 35 U.S.C. 103(a) as being unpatentable over Fertner (5793801) as applied to claim 35 above, and further in view of Chow et al. (5787113).

a. Claims 40,41: Fertner discloses applicant's claim 35, but he fails to mention interpolating the echo signal in the case where the transmitter has a lower sampling rate than the receiver.

Chow teaches that in asymmetric DMT systems (such as ADSL) the upstream data travels at a different rate than the downstream data. He further teaches the use of interpolation of the echo signal in a system with a faster receiver (Fig. 7), and decimation in a system with a faster transmitter (Fig. 8) (Col 12 lines 9-22). It would have been obvious to one of ordinary skill in the art at the time of this application to either decimate or interpolate the echo signal as needed for the purpose of accounting for the different sampling rates between the transmitter and receiver.

b. **Claim 44:** Chow discloses an ADSL transceiver in which the transmitted and received symbols are not aligned in time (CHOW: Col 12 lines 9-22). Fertner's coefficients are used to create an estimate of an echo signal in the time domain and that signal is removed from the received signal on a sample by sample basis in the time domain (FERTNER: Col 7 lines 32-39).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Jamal whose telephone number is 703-305-3433. The examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis A Kuntz can be reached on 703-305-4708. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and 703-872-9315 for After Final communications.

DUC NGUYEN
PRIMARY EXAMINER

AJ
October 30, 2003